XIX. *On the periodical Star α Herculis; with Remarks tending to establish the rotatory Motion of the Stars on their Axes. To which is added a Second Catalogue of the comparative Brightness of the Stars.* *By* William Herschel, *LL.D. F. R. S.*

Read June 9, 1796.

In my first catalogue of the comparative brightness of the stars, I announced α Herculis as a periodical star. The precision of the characters introduced in that catalogue is such, that the smallest alteration in the lustre of the stars may be discovered, by a proper attention to their expressions: the variation in the light of α Herculis is, however, pretty considerable, and cannot easily be mistaken, when strictly compared to a proper standard. The star most conveniently situated for this purpose is κ Ophiuchi; and as I have had no reason, during the time of my observations, to doubt the uniformity of its lustre, I have made use of it in the following comparisons; which seem to be sufficiently decisive, with regard to the periodical variations of the light of α Herculis.

Other stars besides κ Ophiuchi have also been consulted; but the unsteadiness of their light would draw me into difficulties, which at present it will be proper to avoid. For this reason I only give the following table, which will be found to contain at least four regular changes of the alternate increase and decay of the apparent lustre of our new periodical star, deduced from a comparison of its brightness with that of κ Ophiuchi.

In this short table, the number 64 refers to the stars in the constellation of Hercules, and 27 to those in the constellation of Ophiuchus. The characters that are used to denote their relative lustre, have been explained among the introductory remarks to the first catalogue of the comparative brightness of the stars.

Table of the Variation of Light observed in α (FL. 64) Herculis, compared to $\varkappa$ (FL. 27) Ophiuchi.

1795. May 18	64 = 27	1795. Nov. 20	64 ; 27
22	64 = 27	26	64 , 27
July 6	27 ; 64	28	64 ; 27
August 17	27 - 64	Dec. 15	27 ; 64
18	27 - 64	1796. Jan. 9	64 ; 27
September 16	64 - 27	March 5	64 ; 27
17	64 - 27	9	64 ; 27
18	64 , 27	10	64 ; 27
20	64 ; 27	28	27 , 64
21	64 ; 27	April 4	27 ; 64
22	64 , 27	5	27 ; 64
October 2	64 ; 27	9	27 ; 64
6	64 ; 27	May 2	64 ; 27
7	64 ; 27	4	64 ; 27
9	64 . 27	5	64 ; 27
11	64 ; 27	10	64 = 27
15	27 , 64	11	64 = 27
16	27 , 64	14	64 = 27
17	27 , 64	16	64 = 27
25	27 ; 64	17	64 = 27
26	27 ; 64	18	64 - 27
28	27 , 64	19	64 = 27
30	27 ; 64	22	64 - 27
November 3	27 , 64	24	64 ; 27
6	64 . 27	25	64 ; 27
9	64 ; 27	26	64 ; 27
10	64 . 27	27	64 , 27

In order now from this table to obtain the time of the period, we shall first take all the successive observations from the 16th of September till the 28th of November. They shew very clearly that the star has completely gone through all its changes. For, admitting a maximum of the light of α Herculis to have been the 16th of September, we find a minimum the 25th of October; and a second maximum about the 28th of November. The period, therefore, is of somewhat more than two months duration.

But as changeable stars are subject to temporary inequalities, which will render a determination of the length of a period, from a single series of changes, liable to considerable errors, we shall now take the assistance of the most distant observations. By an inspection of the table, we find again the first maximum to have been about the 16th of September, 1795; and the fourth the 14th of May, 1796. This being an interval of 241 days, in which four successive changes have been gone through, we obtain about 60 days and a quarter for the duration of the period.

In confirmation of this computation, the table shews that our periodical star was very faint in August, 1795; bright about the middle of September; faint towards the end of October; bright the latter part of November; faint in December; bright in January, 1796; not observed in February; bright in March; faint in April; and lastly, bright again in May. This is just what should have happened according to the above determination, which, as we have seen, gives a period of eight weeks, four days and a quarter. Greater accuracy can only be obtained by future observations.

On the Rotatory Motion of the Stars on their Axes.

I shall now add a few remarks on the subject of the rotation of the fixed stars on their axes. This motion has been lately mentioned in a paper, where I could not have an opportunity to enter into the reasons why it ought to be admitted.* The discovery of the period of α Herculis furnishes me with an opportunity to say a few words upon the subject, as every addition to the list of periodical stars increases our knowledge of the construction of the celestial bodies. Not so much because now one star more is known to be subject to periodical changes in its lustre; for this would indeed be of no great consequence. But we ought not to be satisfied with merely inrolling this circumstance among the list of facts we are acquainted with. The rotatory motion of stars upon their axes is a capital feature in their resemblance to the sun. It appears to me now, that we cannot refuse to admit such a motion, and that indeed it may be as evidently proved as the diurnal motion of the earth.

Dark spots, or large portions of the surface, less luminous than the rest, turned alternately in certain directions, either towards or from us, will account for all the phænomena of periodical changes in the lustre of the stars, so satisfactorily, that we certainly need not look out for any other cause. Let us, however, take a review of any objections that might be made.

The periods in the change of the lustre of Algol, β Lyræ, δ Cephei, and η Antinoi, are short; being only 3, 5, 6, and 7 days respectively: those of o Ceti, the changeable star in

* Phil. Trans. for the year 1795, Part I. page 68.

Hydra, and that in the neck of the Swan are long, amounting to 331, 394, and 497 days. Will not a doubt arise whether the same cause can be admitted to explain indiscriminately phænomena that are so different in their duration?

To this it may be answered, that the whole force of the objection is founded upon our very limited acquaintance with the state of the heavens. Hitherto we have only had seven stars whose periodical changes have been determined. No wonder then that proper connections between their different periods were wanting. But let us now place α Herculis among the list, which is not less than 60 days in performing one return of its changes. Here we find immediately, that the step from the rotation of α Herculis to that of o Ceti, is far less considerable than that from the period of Algol to the rotation of α Herculis; and thus a link in the chain is now supplied, which removes the objection that arose from the vacancy.

There is, however, another instance of a slow rotatory motion; and it is doubly instructive upon this occasion. In one of my former papers it has been shewn, that the 5th satellite of Saturn revolves on its axis in 79 days; this not only shews that very slow rotatory motions take place among the celestial bodies; but from the arguments that were brought to prove its rotation, which I believe no astronomer will oppose, we are led to apply the same reasoning to similar appearances among the fixed stars. A variation of light, owing to the alternate exposition of a more or less bright hemisphere of this periodical satellite, plainly indicates that the similar phænomenon of a changeable star, arises from the various lustre of the different parts of its surface, successively turned to us by its rotatory motion.

The rotations of the sun and moon, and of several of the planets, become visible in a telescope by means of the spots on their surfaces; the remote situation and smallness of the 5th satellite of Saturn, leave us without this assistance; but what we can no longer perceive, with our best optical instruments, we now supply by rational arguments. The change in the light of the satellite proves the rotation; and the rotation once admitted, proves the existence of spots, or less luminous regions on its surface, which at setting off were only hypothetical. In the same manner a still more extended similarity between the sun and the stars offers itself, by the spots that now must also be admitted to take place on their surfaces, as well as on that of the sun.

To return to the difficulty which has been started, it may be further urged, that there are some reasons to surmise that the 34 Cygni is a periodical star of 18 years return;* and that other stars seem very slowly to diminish their lustre, and may probably recover it hereafter.

In answer to this, I remark that it will not be necessary to remove objections to the rotatory motion of the stars, inferred from their very slowly changeable lustre, till they come properly supported by well ascertained facts. Many causes in the physical construction of the stars may occasion an accidental and gradual increase or decay of brightness, not subject to any regularity in its duration. But when settled periods can be ascertained, notwithstanding they should be of the most extended duration, it will not be difficult to find other causes to explain them, without giving up the rotatory motion. When the biography of the stars, if I may be allowed the expression,

* Phil. Trans. for the year 1786, Part I. page 201.

is arrived to such perfection as to present us with a complete relation of all the incidents that have happened to the most eminent of them, we may then possibly not only be still more assured of their rotatory motion, but also perceive that they have other movements, such as nutations or changes in the inclination of their axes; which, added to bodies much flattened by quick rotatory motions, or surrounded by rings like Saturn, will easily account for many new phænomena that may then offer themselves to our extended views.

Memorandum relating to the following Catalogue.

It was my intention to have continued to remark all the deviations of brightness, here assigned to the stars, from the magnitudes which are given by FLAMSTEED, either in his observations, or in the British catalogue; but I now find this author so little consistent, that it appears to be of no use to refer to his determinations. In the constellation of Aries are no less than 31 stars, in which the magnitudes of his catalogue differ from those we find in his observations; and these are generally the stars of the greatest brightness. The difference is also very considerable: thus, 41 Arietis is observed 6m, the catalogue gives 3m; 50 is observed 7m, the catalogue gives 5m; 35 is 5m, catalogue 4m; 33 is 6m, catalogue 5m; 38 is 6m, catalogue 7m.

The notes to these and the remaining constellations, therefore, will now be confined chiefly to my own observations, and to the correction of errors that have fallen under my notice.

II. *Catalogue of the comparative Brightness of the Stars.*

Lustre of the stars in Aries.			
1		7.6	Does not exist.
2		7.6	2, 8 2; 8
3		6	4, 3
4		7.6	8 – 4, 3
5	γ	4	41.5 5 – 3 Aurigæ 92 Ceti, 5 41 – 5 5; 37 Cassiop 99 Pisc 5 –, 110 Piscium
6	β	3	6 – 4 Trianguli 88 Pegasi; 6
7		tel.	14 – 7
8	ι	6	17.8.22 2; 8 – 4
9	λ	5	9, 12 9; 12 9, 14
10		6.7	14, 10 – 21
11		6	20, 11.16
12	$\varkappa$	6.5	9, 12 9; 12 12 – 17
13	α	2	57 Andro; 13 13, 23 Aurigæ 43 Andromedæ; 13
14		6	14, 10 9, 14 – 7
15		6	22.15 –, 18
16		8	11.16
17	η	6	17.8 12 – 17, 22
18		7	15 –, 18.23
19		6.7	20, 19
20		6	21.20, 11 20, 19
21		7	10 – 21.20
22	θ^1	6.5	8.22 17, 22.15
23	θ^2	7	18.23
24	ξ	6	31, 24 65 Ceti, 24, 64 Ceti
25		7	64 Ceti – 25
26		6.7	29, 26, 27

Lustre of the stars in Aries.			
27		6.7	26, 27
28		6	Does not exist, or is lost
29		6.7	29, 26
30		7	35, 30 – 33 16 Trianguli, 30
31		5.6	38 – 31, 24
32	ν	6	48 =' 32 ; 34
33		5	30 – 33 35, 33 33 –, 16 Trianguli
34	μ	6	32 ; 34
35		4	39, 35, 33 35, 30 35 · 57
36		7	53; 36 · 50
37	o	6	43 · 37
38		7	38 – 31
39		4	39, 35
40		6	46 · 40, 45
41		3	41 · 5 41 – 5
42	π	6	42 ; 46 42, 43
43	σ	6	42, 43 · 37
44	ρ^1	6	54, 44
45	ρ^2	6.7	40, 45, 53
46	ρ^3	6.7	42 ; 46 · 40
47		6.7	63 · 47, 65
48	ε	5	58 · 48 · 63 48 · 57 48 =' 32
49		7	52 ; 49 · 51
50		7	36 · 50 · 54
51		7	49 · 51
52		6	52 ; 49 52, 56
53		7	45, 53; 36
54		6.7	50 · 54, 44
55		7	56 · 55
56		6.7	52, 56 · 55
57	δ	4	35 · 57 · 58 48, 57, 58

Lustre of the stars in Aries.			
58	ζ	5	57 . 58 . 48 57 , 58 , 61
59		7	62 – 59 , 60
60		7	59 , 60 . 64
61	τ^1	7	58 , 61 , 63
62		6	62 – 59
63	τ^2	6	48 . 63 61 , 63 , 65 63 . 47
64		6	60 . 64 – 66
65		7	63 , 65 47 , 65
66		7	64 – 66 7 Tauri . 66
Lustre of the stars in Canis major.			
1	ζ	3	1 . 24
2	β	2	21 , 2 , 25
3	λ	4	3 . 13 3 ; 8 Columbæ
4	ξ^1	5	4 , 5
5	ξ^2	5	4 , 5
6	ν^1	5	8 – 6
7	ν^2	5	7 , 8 7 , 23
8	ν^3	5	7 , 8 – 6
9	α	1	9 – – – all 1 m
10	$\varkappa^1$	6	13 – 10
11		5	18 . 11
12	ρ	6	17 . 12
13	$\varkappa^2$	5	3 . 13 – 10
14	θ	5	14 , 20
15	π^1	6	19 . 15 – 17
16	o^1	5	22 , 16 , 28
17	π^2	6	15 – 17 . 12
18	μ	4	20 , 18 . 11
19	π^3	6	19 . 15
20	ι	4	23 , 20 14 , 20 , 18

Lustre of the stars in Canis major.			
21	ε	3.2	21, 2 21 – 2
22		4	22, 16
23	γ	3	7, 23, 20
24	o^2	5.4	1. 24
25	δ	2.3	2, 25, 31
26		7	27, 26
27		7	28 – 27, 26
28		5	16, 28 – 27 28 – 30
29		5	30. 29
30		5	28 – 30. 29
31	η	3.2	25, 31 15 Navis, 31
Lustre of the stars in Canis minor.			
1		7.6	6, 1 7, 1 11, 1
2	ε	6	4, 2, 5
3	β	3	3 – – 4
4	γ	6	3 – – 4, 2 4. 6
5	η	6	2, 5
6	o	6	4. 6, 1 6, 11
7	δ^1	6	7, 1 7. 9
8	δ^2	6	9. 8
9	δ^3	6	7, 9. 8
10	α	1.2	19 Orionis ⁊ 10 58 Orionis . 10 19 Orionis –, 10
11	π	6	6, 11, 1
12		5.6	Does not exist.
13	ζ	5	13 Navis, 13 – 14 13 Navis – 13
14		6	13 – 14

Lustre of the stars in Cassiopea.			
1	*e*	6	3, 1 – – 2
2		7	1 – – 2
3		6	7 · 3, 1 7 · 3 · 8
4	*d*	5	5, 4 – 6
5	τ	5	8 – 5, 4 5 – 12 5, 14
6		6	4 – 6 · 9
7	ρ	6	7 · 3
8	σ	6	3 · 8 – 5
9		6	6 · 9 · 10
10		6	9 · 10
11	β	3 · 2	27, 11 27 · 11
12		6	5 – 12 – 13 14, 12
13		6	12 – 13 · 16
14	λ	5	17 – – 14 33, 14 5, 14, 12
15	$\varkappa$	4	15, 33
16		6	13 · 16
17	ζ	4	24, 17 – – 14 24 – 17
18	α	3	18; 27 18 · 27
19	ξ	6	19 – 25
20	π	6	22, 20
21		6	21; 23
22	*o*	6	22, 20
23		6	21; 23
24	η	4	24, 17 24 – – 33 24 – 17
25	ν	5	19 – 25
26	υ^1	7	28; 26
27	γ	3	18; 27, 11 18 · 27 · 11
28	υ^2	6	28; 26
29		6	Does not exist.
30	μ	5	33 = ∓, 30
31		6	36 – 31, 43 46, 31

Lustre of the stars in Cassiopea.			
32		6	32 – 35
33	θ	4	24 – – 33, 14 33 = ∓ 30 15, 33
34		6	44 – 34
35		7	32 – 35
36	Ψ	5.6	36 – 31 36, 46
37	δ	3	5 Arietis ∓ 37 – – 45
38		6	42 – 38 40, 38
39	χ	6	39, 44
40	*h*	6	42, 40, 38
41		6	Does not exist.
42	*g*	6	48 – 42 – 38 42, 40
43	*c*	6	31, 43
44		6	39, 44 – 34
45	ε	3	37 – – 45
46	*d*	6	36, 46, 31
47		5	47, 49
48	*e*	5	50 – 48 – – 54 48 – 42
49		6	47, 49
50	*f*	4.5	50 – 48
51		6	Does not exist, or is lost.
52		7	53 ∓ 52 53, 52 – 55
53		7	53 ∓ 52 53, 52
54		6	48 – – 54
55		6	52 – 55
Lustre of the stars in Cetus.			
1		6	6, 1 9, 1
2	*g*	4.5	2, 7
3		6	17, 3, 19
4		6	4.5
5		6	4.5

Lustre of the stars in Cetus.			
6	*f*	5	7 – 6, 1
7	*b*	5	2, 7 – 6
8	*i*	3	8 . 31
9		6	9, 1
10		6	12 – 10, 11 12, 10 44 Piscium – 10
11		6	10, 11
12		6	13, 12 – 10 13, 12 . 15 13 – 12, 10
13		6	13, 12 20, 13, 12 13 – 12
14		6	Does not exist.
15		6	12 . 15
16	β	3	8 Pegasi ; 16 § 44 Pegasi
17	φ^1	5	17, 19 17, 3
18		6	23, 18
19	φ^2	5	17, 19 – 22 3, 19
20		6	20, 13 20 – 26
21		6	27 . 21
22	φ^3	5	19 – 22 . 23
23	φ^4	5	22 . 23, 18
24		6	Does not exist.
25		6	25 . 37
26		6	20 – 26, 33
27		6	28, 27 . 30 27 . 21
28		6	37, 28, 27
29		6	35, 29
30		6	27 . 30, 32
31	η	3	8 . 31 . 45
32		6	30, 32 . 41 32 . 44
33		6	26, 33, 35
34		6	34, 38
35		6	33, 35, 29
36		6	36 . 41

Lustre of the stars in Cetus.			
37		5	25 · 37, 28
38		6	34, 38 · 39
39		6	38 · 39, 40
40		6	39, 40 · 42
41		6	32 · 41 36 · 41
42		6	40 · 42 · 43
43		6	42 · 43
44		6	32 · 44
45	θ	3	31 · 45 45, 52
46		5	50, 46 48 · 46 53 – 46
47		6	47, 49
48		6	48 · 46
49		6	47, 49 · 50
50		6	49 · 50, 46
51		6	110 Piscium – 51, 98 Piscium
52	τ	3·4	45, 52 · 55
53	χ	5	55 – – 53 – 46
54		6	64, 54
55	ζ	3	52 · 55 – – 53
56	υ^1	4	59 – 56, 57
57		5	56, 57 57 · 74
58		6	58, 66
59	υ^2	4·5	59 – 56
60		6	60 – 61
61		7	60 – 61, 63
62		6.7	63 – 62 71 . 62
63		6	66, 63 – 62 61, 63
64		6	65 – – 64, 54 65 –, 64 24 Arietis, 64 – 25 Arietis
65	ξ^1	6	65 – – 64 73 . 65 –, 64 65 ; 91 65, 24 Arietis

Lustre of the stars in Cetus.			
66		6	66, 63 58, 66, 63
67		6	80, 67
68	o	3.2	68 < 10 m 68 = 13 Arietis 68 > 13 Arietis 87 Tauri > 68
69		6	69 . 70
70		6	69 . 70, 75
71		6	71 . 62 81, 71 - 79
72	ρ	4	83 . 72
73	ξ^2	5.4	87, 73 . 65 73 - 91
74		6	57 . 74
75		5.6	70, 75, 84
76	σ	4	89 - 76 . 83
77		6	77 . 80
78	ν	4.5	96, 78, 97 88, 78 - 85
79		6	71 - 79
80		6	77 . 80, 67
81		6	81, 71
82	δ	3	86 - 82
83	ε	3	90, 83 76 . 83 . 72
84		6	75, 84
85		6	78 - 85 88 -, 85
86	γ	3	86 - 82
87	μ	4	87, 73
88		6	88, 78 88 -, 85
89	π	4.3	89, 90 89 - 76
90		8	89, 90, 83
91	λ	4	73 - 91 65 ; 91
92	α	2	92, 4 Arietis
93		6	96 - 93, 97
94		6	96, 94 - 95
95		6	94 - 95

		Lustre of the stars in Cetus.	
96	κ^1	5	96, 78 96, 94 96-93
97	κ^2	4	78, 97 93, 97
		Lustre of the stars in Corvus.	
1	α	4	7-1-8
2	ε	4	9, 2. 7
3		6	5-3-, 6
4	γ	3	4, 9
5	ζ	5	8-5-3
6		6	3-, 6
7	δ	3	9, 7-1 2. 7-1
8	η	5	1-8-5
9	β	3	4, 9, 7 4, 9, 2
		Lustre of the stars in Eridanus.	
1	τ^1	4	11, 1-2
2	τ^2	4	1-2, 4
3	η	3	18. 3
4		6	2, 4, 6 15, 4
5		6	5-, 7
6		6	4, 6
7		6	5-, 7
8	ρ^1	6	10. 8
9	ρ^2	5	13-9, 10 13-9-14
10	ρ^3	4	9, 10. 8
11		3. 4	16, 11, 1 16, 11. 27
12		3	19, 12
13	ζ	3	13-9
14		6	9-14
15		6	15, 4 15-20

Lustre of the stars in Eridanus.			
16		4	16, 11
17		4·5	17 – 22
18	ε	3·4	23, 18 – 26 23, 18 . 3
19		4	27, 19, 12
20		5.6	15 – 20
21		6	22 ; 21
22		5.6	17 – 22 ; 21
23	δ	3·4	34 –, 23, 18 53, 23
24		5	32, 24 ; 25 24 – 25
25		6	24 ; 25 24 – 25
26	π	4	18 – 26, 32
27		4	11 . 27, 19 27 – 33
28		6.5	36, 28
29		6.7	30, 29
30		5.6	32 – 30, 29
31		5.6	Does not exist
32		4·5	26, 32 – 30 26, 32 –, 35 32, 24
33		4·5	27 – 33 . 36
34	γ	2	67, 34 –, 23
35		5	32 –, 35
36		4	33 . 36, 28
37		6	40, 37
38	o	3·4	38, 40
39	A	5	40 . 39, 42
40	*d*	5	38, 40 – 37 40 . 39
41		4·3	41, 43
42	ξ	4·3	39 . 42
43		5	41, 43
44		5.6	49 . 44
45		5.6	45 . 49
46		5	46 . 47

Lustre of the stars in Eridanus.			
47		4	46 . 47 , 56
48	ν	4	48 . 57 48 –, 51
49		5 . 6	45 . 49 . 44
50	υ^1	4	50 . 52 52 , 50
51	c	4	57 –, 51 48 –, 51
52	υ^2	3	50 . 52 52 , 50
53		3 . 4	53 , 23
54		3 . 4	54 – 60
55		6	56 , 55
56		6	47 , 56 , 55 63 – 56
57	μ	4	48 . 57 –, 51
58		5 . 6	60 , 58 . 59
59		6	58 . 59
60		6	54 – 60 , 58
61	ϖ	5	69 , 61 , 65
62	b	6	65 –, 62
63		6	64 – 63 – 56
64		6	64 – 63
65	Ψ	5	61 , 65 –, 62
66		6	68 . 66
67	b	3	67 , 34 67 – – 68
68		6	67 – – 68 . 66
69	λ	4	69 , 61
Lustre of the stars in Gemini.			
1	H	5	18 – 1 – 139 Tauri
2		8	5 – 2 . 4
3		8	3 , 5
4		7	2 . 4 . 6
5		7	3 , 5 – 2
6		7	4 . 6

Lustre of the stars in Gemini.			
7	η	4.5	13, 7 – 31 13 ; 7 –, 31
8		7.8	8 . 9
9		7	8 . 9 . 10
10		8	9, 10 . 11
11		8	10 . 11 . 12
12		8	11 . 12
13	μ	3	27 ; 13, 7 13, 27 13 ; 7
14		7.8	16 . 14 . 15
15		7	14 . 15, 17
16		7	16 . 14
17		8	15, 17
18	ν	4	69 . 18 – 1
19		7	20, 19, 23
20		7.8	20, 23 20, 19 20 – 23
21		6.7	Does not exist.
22		7	23, 22
23		5	20, 23 19, 23, 22 20 – 23
24	γ	2.3	50 Orionis, 24, 37 Aurigæ 66 –, 24
25		7	54 Aurigæ – 25
26		5	26 . 61
27	ε	3	27 ; 13 13, 27
28		6	53 Aurigæ . 28, 54 Aurigæ 36, 28
29		6.7	Does not exist.
30	ξ^1	6	31 - 30 . 38
31	ξ^2	5.4	7 – 31 – 30 7 –, 31
32		6	35, 32
33		6.7	35 · 33
34	θ	4	77, 34 – 43
35		6	38, 35, 32 35 · 33
36	d	6	36, 28 36, 37
37		6	36, 37, 39

Lustre of the stars in Gemini.			
38	*e*	6	30 . 38 – 35
39		6.7	37 , 39 . 40
40		6	39 . 40
41		6	45 – 41 45 , 41 , 50
42	ω^1	6	42 –, 44
43	ζ	3.4	34 – 43
44	ω^2	6.7	42 –, 44
45	*o*	6	51 – 45 – 41 68 , 45 , 41
46	τ	5	60 – 46 69 , 46 62 – 46
47		6	48 , 47 , 52
48	*m*	6	57 – 48 , 47
49		7	52 – 49 58 , 49
50		6	41 , 50
51		6.5	51 – 45 51 , 68
52	*n*	7.6	47 , 52 – 49 52 , 58
53		6.7	59 . 53
54	λ	5	54 ; 55
55	δ	3	55 . 77 54 ; 55
56	*q*	6.7	56 ; 63
57	A	5.6	57 – 48
58		7.8	52 , 58 , 49
59		6	64 – 59 59 . 53
60	ι	4.5	60 – 65 60 – 46 60 , 62
61	*r*	6	26 . 61 63 , 61
62	*s*	5	60 , 62 , 46
63	*p*	6	56 ; 63 , 61
64	b^1	6	65 . 64 – 59
65	b^2	6	60 – 65 . 64
66	α	1	78 –, 66 –, 24 66 . 34 Aurigæ
67		7.8	68 –, 67
68	*k*	6	68 –, 67 51 , 68 , 45 68 , 81

Lustre of the stars in Gemini.			
69	υ	5	69 . 18 69 , 46
70		5	80 – 70
71	o	5	71 . 80
72		6	Does not exist.
73		6.7	Does not exist.
74	f	6	81 , 74 – 85
75	σ	5	75 , 83
76	c	6	83 – 76
77	$\varkappa$	4.5	55 . 77 , 34
78	β	2	78 –, 66 78 , 67 Virginis 87 Tauri – – 78
79		7	82 . 79 , 84
80	π	5	71 . 80 – 70
81	g	6	68 , 81 , 74
82		6	85 – 82 , 84 82 . 79
83	φ	5	83 – 76 75 , 83
84		5	82 , 84 79 , 84
85	l	6	74 – 85 – 82
Lustre of the stars in Leo.			
1	$\varkappa$	4	4 ; 1 1 –, 22
2	ω	5	6 – 2 ; 3
3		6	2 ; 3
4	λ	4	4 ; 1
5	ξ	4	10 , 5 – 6
6	b	6	5 – 6 – 2
7		6	16 – 7 , 11 8 , 7
8		6	16 , 8 , 7
9		6	13 , 9 – 12
10		5	10 , 5
11		6	7 , 11
12		7.8	9 – 12

Lustre of the stars in Leo.			
13		6	13, 9
14	o	3·4	14, 47 14, 30
15	f	6	22 . 15
16	ψ	6	16 – 7 16, 8
17	ε	3	68 – – 17 – 70 17 – 36 17 – 30 68 –, 17 –, 36 17 –, 70
18		6	18, 23
19		7	23 . 19, 21
20		6	22 –, 20
21		7	19, 21
22	g	6	22 . 15 1 –, 22 –, 20
23		6	18, 23 . 19
24	μ	3·4	47, 24
25		6.7	Does not exist.
26		7	Does not exist.
27	ν	4·5	29 – 27
28		7	Does not exist.
29	π	4	29 – 27 31 – 29
30	η	3·4	70 . 30 17 – 30 36 . 30 14 . 30
31	A	5	31 – 29 31 – 40
32	α	1	78 Geminorum –, 32, 66 Geminorum
33		6.7	Lost or 34 – – 33
34		7	42 – 34
35		6	39; 35
36	ζ	3	17 – 36 . 70 70 . 36 . 30 36 – 46 Leonis minoris 17 –, 36
37		6	37 – 42
38		6	Does not exist.
39		6	39; 35
40		6	31 – 40
41	γ	2	41, 94 41 – 94 41 –, 94

Lustre of the stars in Leo.			
42		6	37 – 42 – 34
43		6	44 , 43
44		5.6	44 , 45 49 , 44 , 43
45		6	44 . 45 46 , 45
46	*i*	6	46 – 47 Leonis minoris 46 , 45 46 – 50 46 . 51
47	ρ	4	14 , 47 , 24
48		6	48 , 49
49		6	48 , 49 , 44
50		7.6	46 – 50
51	*m*	6	46 . 50
52	K	6	41 Leonis minoris – 52 53 , 52
53	*l*	6	53 , 52
54		4.5	60 . 54 –, 72
55		6.5	55 – 57 55 , 62
56		6.7	59 –, 56
57		6	55 – 57 62 , 57
58	*d*	6.5	63 – 58 ; 59
59	*c*	5	58 ; 59 59 –, 56
60	*b*	5	60 . 54
61		5	61 , 69
62	*g*	6	55 , 62 , 57
63	χ	4.5	63 – 58
64		6	67 – 64
65		6	79 , 65 , 76
66		6	69 – 66
67		6	72 –, 67 – 64
68	δ	2 . 3	94 – 68 – – 17 68 –, 17
69		5.6	61 , 69 – 66
70	θ	3	17 – 70 36 . 70 . 30 17 –, 70 . 36
71		6	Does not exist.

Lustre of the stars in Leo.			
72		5	54 –, 72 –, 67
73	*n*	6	73 ; 81
74	φ	4	91 . 74 –, 87
75		6	84, 75, 79
76		7	79 – 76 65, 76
77	σ	4.5	77, 78
78	ι	4	77, 78 – 91
79		5.6	75, 79 – 76 79, 65
80		6	89 – 80 – 83
81		6	73 ; 81 86 – 81, 90
82		7.8	83, 82
83		8	80 – 83, 82
84	τ	4	84, 75
85		6	85, 88 90, 85
86		6	86 – 81
87	*e*	4.5	74 –, 87
88		6	85, 88
89		6	89 – 80
90		6	81, 90, 85
91	υ	4	78 – 91 . 74
92		6	95, 92
93		4	93 –, 95
94	β	1.2	41, 94 41 – 94 41 –, 94 – 68
95	ο	6	93 –, 95, 92

Notes to Aries.

1 There is no observation of this star in FLAMSTEED's works. Perhaps one of the observations of 104 Piscium was placed 8 degrees too much north, which would produce the first Arietis.

2 There are two stars, the largest of which I take to be the 2d Arietis, and have estimated its brightess.

28 There is an observation in the second volume of the *Historia Cœlestis*, page 181; and in all appearance it is a good one. But as we find no where the 26th and 28th observed together, it is probable that only one of them existed in FLAMSTEED's time. The observation, Dec. 10, 1692, being corrected — 1′ of time in RA, will agree with the four observations on page 81, 181, 273, and 283.

Catalogue and Atlas.

1 and 28 should be out.

Atlas.

A small star under 41 towards 16 Trianguli should be out.

Notes to Canis major.

" Order of magnitude Nov. 17, 1784. ε 2m β 2.3m δ 3.2m η 3m ο 4m."

2 " Is 3m, January 9, 1796."

23 " Is hardly 5m, January 9, 1796."

Notes to Canis minor.

3 " Is 4m, January 9, 1796."

10 The comparative brightness at first sight is 10 – 19 Orionis; but the light of Rigel being more brilliant than that of Procyon, a continuance of its impression, when we look a good while, occasions an increase; and it becomes 19 Orionis ⁊ 10.

12 FLAMSTEED never observed this star.

Catalogue and Atlas.

12 should be out.

Notes to Cassiopea.

" Order of magnitude May 12, 1783. $\beta\,\alpha\,\gamma$ 2″m $\delta\,\varepsilon$."

8 There are two stars, nearly equal.

29 There is no observation of FLAMSTEED of this star.

41 There is no observation of this star by FLAMSTEED.

51 FLAMSTEED observed this star Dec. 16, 1691. The observation, however, is marked defective in zenith-distance. There is a star, about 9 or 10m, near the place where 51 should be.

55 That which I have estimated is the largest of several small stars about the place of 55.

Catalogue and Atlas.

29, 41, and 51 should be out.

52 and 53 are not laid down in Atlas as they are in the heavens; and on examining FLAMSTEED's observation on page 208, it appears that the catalogue is erroneous; for by that observation 52 is the most north, and 53 the most south, contrary to the catalogue.

Notes to Cetus.

14 There is no observation of this star by FLAMSTEED.

24 There is no observation of this star by FLAMSTEED.

51 Is 106 Piscium.

68 A periodical star of a great range in its lustre, as appears from the expressions I have given of its comparative brightness. Its period is 331 days, 10 hours, 19 minutes. See Phil. Trans. 1792, Part I. page 25. Different authors, however, vary a little in their determinations of the length of this period; for which we may account by admitting the star to be subject to considerable alterations in the emission of light, from some parts of its surface, which being more copious sometimes in one place, and sometimes in another at some small distance, will give a different result to the observations of the time of its maximum; while, notwithstanding, the general period of its changes will not be considerably affected by it. We have a similar instance in the rotation of Jupiter, which seems to vary on account of the little stability of its spots. See Phil. Trans. 1781, Part I. page 123 to 126.

90 Is 1 Eridani.

Catalogue and Atlas.

14 and 24 should be out.

54 "requires + 1′ 8″ of time in RA. Sept. 4, 1786."

Atlas.

18 "Is not laid down very accurately in Atlas, Sept. 22, 1795."

Notes to Corvus.

" Order of magnitude May 12, 1783. $\gamma\ \delta\ \beta\ \alpha$."

The order, by the present catalogue, does not agree with that in 1783. It is no longer $\delta\beta$, but $\beta\delta$; but the constellation is so low that precision is difficult.

Notes to Eridanus.

1 Is 90 Ceti.

31 FLAMSTEED has no observation of this star.

Catalogue and Atlas.

31 must be out.

40 " requires + 6′ in PD, January 31, 1786."

Notes to Gemini.

21 There is an observation by FLAMSTEED on page 294, but with a small correction, minus, in time it will agree with 20; and my double star IV. 46 marked 21 : : is 20 Geminorum.

29 There is no observation by FLAMSTEED upon this star.

54 Seems to be increasing. There is an interval of 9 months between the two observations of my catalogue. Mr. BODE supposes the star to be changeable. See *Astronomisches Jahr-Buch*, 1788, page 255. And 1793, page 201.

72 and 73 There are no observations of these stars by FLAMSTEED.

78 " β appears to be of a deeper colour than it was a good " many years ago. I should now (Jan. 8, 1796) place it

"among the red, or ruddy stars; which formerly I did not "use to do."

Catalogue and Atlas.

21, 29, 72, and 73 should be out.

Atlas.

17 requires — 15′ in PD.

Notes to Leo.

"Order of magnitude May 12, 1783. α 1‴ m γ 2′ m β 2′ m δ ε ζ θ η μ ο ρ ν σ."

25 There is no observation of this star by FLAMSTEED; but if — 14′ 30″ in RA and + 2° 25′ 25″ in PD be applied, according to the edition of 1712, the place will then agree with 10 Sextantis. There are two very small stars near the place where 25 is put in Atlas; one of them is the star V. 63, which in my catalogue of double stars is called 25 Leonis.

26 There is an observation of this star by FLAMSTEED on page 299; but it is defective.

28 There is an observation without time on page 299, marked "*Leonis*," taken after the transit of Mars, which has probably occasioned the insertion of 28 into the British catalogue; but the observed star must have been 11 Sextantis.

38 In the observation, March 10, 1691; the number 821,66 is cast up 6 degrees too little, which produced this star; when the error is corrected, we find that the star observed was 37.

41 This is the double star in my second catalogue I. 28, and by a series of observations, it appears now that the distance between the two stars is considerably increased, since

the year 1782. I mention this circumstance here, as it will probably explain some apparent increase of brightness, that seems to have taken place in this star; for although the same quantity of light, when it is spread over more space, must appear less intense than it will do when it remains in a more confined state, it may nevertheless, by an increase of apparent magnitude, become entitled to be ranged upon a par with a brighter star.

71 FLAMSTEED never observed this star.

94 From the expressions of this catalogue, it is evident that the star is less now than it was 13 years ago.

420 of MAYER'S catalogue is not visible.

Catalogue and Atlas.

25, 26, 28, 38, and 71 should be out.

WM. HERSCHEL.

Slough, near Windsor,
June 1, 1796.